DWG NO. 89A1504

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NEXT ASSEMBLY	MODEL NO.	**SPERRY✛UNIVAC**

DR			CODE IDENT NO. **21101**	TITLE V77 MAINTAIN III DISKETTE STORAGE SYSTEM TEST SOFTWARE PERFORMANCE SPECIFICATION		
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ENGR		3/26		SIZE **A**	DWG NO. W 8901504	REV B
APPD		7/26				
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SECTION 1
SYSTEM OVERVIEW

1.1 - INTRODUCTION

The Diskette Storage System Test Program (hereafter referred to as the test program) tests the diskette controller and its associated diskette storage units and reports any errors. The test program may be used on any of the diskette storage systems. The test program consists of a series of subtests which provide a means of comprehensively testing the diskette system, and provide an aid in isolating known faults. The test program also includes an initialization routine which allows the user to enter certain hardware dependent parameters prior to testing. The user can select the subtests he wishes to perform by entering the appropriate commands through the console teletype. The test program is designed to operate with the V70/620 Maintain III Test Executive Program (see document 98A9952 07r for information regarding the Test Executive).

1.2 - HARDWARE SUMMARY

The minimum hardware configuration for running the test program is a V70 series computer with 8Kwords of memory, a Diskette Storage System Control Unit (DCU), and one diskette storage unit.

The Diskette Storage System Control Unit has built-in BIC and PIM functions. The test program allows for the testing of these functions.

An initialization dialogue prior to testing enables the program to modify itself to conform to any system configuration. The Diskette Storage System Control Unit device address and the BIC device address are specified. The occurance of data transfer complete is to be determined in either a sense or interrupt mode. If the occurence of this event is to be determined in the interrupt mode, the interrupt mask, trap location and device address for the priority interrupt module (PIM) associated with the interrupt must be specified. The diskette control unit may control up to four diskette storage units.

Refer to the Diskette Storage System User's Manual for a description of the pertinent diskette control unit and the applicable V70 instruction set.

1.3 - SOFTWARE DESIGN SUMMARY

The test program consists of an initialization routine and eleven test routines. The initialization routine allows the user to enter run-time parameters describing the system to be tested.

The eleven test routines are the Write Test, Read Test, Echo Test, Seek Test, Unique Address Test, Compatibility Test, Data Transfer Test, Burn-In Test, Sense/Status Test, Format Test, and a Down Track Function.

1.3.1 - Write Test

The Write Test allows the user to write a block of specified length, starting at a specified track/sector, on the specified diskette storage unit. The user may also specify which status bits are to be checked, and whether a fixed or random data pattern is to be used.

1.3.2 - Read Test

The Read Test allows the user to read and verify a block of data of specified length, starting at a specified track/sector, on the specified diskette storage unit. The user may also specify which status bits are to be checked.

1.3.3 - Echo Test

The Echo Test allows the user to write, read, and verify a block of data. The test is essentially a combination of the Write and Read Tests.

1.3.4 - Seek Test

The Seek Test allows the user to position the specified diskette storage unit to a designated track. The user may also specify which status bits are to be checked.

1.3.5 - Unique Address Test

The Unique Address Test writes the track and sector address of each sector in the first two words of the sector, filling the remainder of the sector with a circulating bit pattern, until each sector on the diskette storage device has been written. It then reads each sector and verifies the address/data. The test verifies the uniqueness of addresses for each sector on the diskette storage unit.

1.3.6 - Compatibility Test

The Compatability Test allows the user to check the interchangeability of diskettes among the diskette storage units. The test is essentially the read portion of the Unique Address Test.

1.3.7 - Data Transfer Test

The Data Transfer Test seeks to a random track on the specified diskette storage unit and writes a block of random data, of random length, at a random sector address. It then reads and verifies the block, reporting any errors. The test makes 512 seek/write/read passes each time it is selected.

1.3.8 - Sense/Status Test

The Sense/Status Test performs a series of diskette operations on the specified diskette, producing those error conditions that can be programmably generated, and verifying that the error conditions are correctly reported.

1.3.9 - Burn-In Test

The Burn-In Test is a continuous running of the Data Transfer Test with the following exceptions. It reports only up to five errors per block, at the end of each 512 block pass it reports the pass count, the error count, and the number of words recovered correctly.

1.3.10 - Format Test

The Format Test executes a format diskette command to the specified diskette storage unit, reads the sector addresses generated, and reports to the user any format problems that are detected by the program or reported by the diskette controller.
NOTE: This format is NOT compatible with VORTEX

1.3.11 - Multiple Unit Test

The Multiple Unit Test allows for the rapid change from one unit to another between reads and writes.

1.3.12 - Down Track Function

The Down Track Function allows the user to declare a track

as being bad, and the controller will flag the track as bad and reformat the remainder of the diskette.

1.4 - USER FACILITIES

The program provides the following features:

Provides cross-sector and partial sector write/read verification.

Assures unique addressability of tracks and sectors.

Assures data transfer accuracy.

Allows the interchangeability of diskettes to be checked.

Provides initialization dialogue so test program can conform to the system configuration.

SECTION 2
EXTERNAL SPECIFICATION

2.1 - GENERAL

The external specification describes the operating
procedures needed to use the various features of the test
program and contains the information needed to interpret
their results. The V70/620 Maintain III Test Executive
Program must be loaded before the test program can be
executed. The test program is normally loaded and its
various features executed by commands issued through the
console keyboard and errors or program status reported
through the console printer. The Test Executive is the
software interface for accomplishing this.

2.2 - LOADING PROCEDURE

Load the V70/620 Maintain III Test Executive program,
followed by the Diskette Storage System Test Program using
the procedure described in chapter 2 of the V70/620 Maintain
III Reference Manual (98A9952 07r).

2.3 - INITIALIZATION

When the test program is loaded and execution begins, it
identifies itself and enters an initialization dialogue with
the user. This allows the user to specify certian hardware
dependent parameters.

The following example shows the console input/output
messages generated during a typical initialization dialogue
followed by a discription of the dialogue. Those messages
which are underscored are typed by the user.

THIS IS THE V70/620 TEST EXECUTIVE
MEMORY SIZE IS 8K

L.
        DISKETTE STORAGE SYSTEM TEST

DISKETTE CONTROLLER DA 14.
BIC DA 20.
TRANSFER COMPLETE TRAP INFORMATION 40,100,376.
CONTROLLER COMPLETE TRAP INFORMATION 40,104,373.
CONFIGURATION CHANGE TRAP INFORMATION 40,102,375.
READ RETRY COUNT 5.
WRITE RETRY COUNT 3.

**

The test program was loaded under control of the Maintain
III Test Executive, identified itself and requested the
diskette controller and BIC device addresses. After these
had been entered the program requested the BIC interrupt
information, the user responded with the PIM device address,
the interrupt location, and the PIM mask. If the test is to
be run without the use of interrupts, only a period need be
input. If interrupts are being used the program requests
the controller interrupt information. The response is in
the same format as that used for the BIC. (Note that
although the PIM device addresses are the same the masks are
different, the program will automatically use the correct
mask value.) The program asks for the number of retries for
both read and write, the user responded with non-zero values
for the retry counts. When the dialogue was complete the
test program prompt "**" was output by the test monitor and
the program waited for the user to begin testing.
The initialization dialogue may be restarted by toggling
sense switch 3 at any point where input is requested.

2.4 - OPERATING PROCEDURE

Before running any test on a unit, the unit must have a
diskette mounted, and the ON/OFF switch must be in the ON
position.

The test monitor enables the user to input a command string
which selects a particular test for execution and provides a
parameter list to be associated with the test. The test
monitor outputs two asterisks to notify the user it is
awaiting input. The first character of the command string
identifies the test to be executed.

Some of the fields of the command string are validated,
others are not checked so that error conditions may be
produced. An example of this would be issuing a seek to an
illegal track address. If, in the fields checked, an
invalid parameter is specified, the program will output a
question mark "?", a carriage return, line feed, the test
monitor prompt "**" and wait for a new command string to be
entered. Each command string is terminated by a period.

The following is a list of parameters used in the command
string and their meaning:

     unit=

address of the diskette storage unit [0-3]

track=
   track address (decimal field) [0-74]

sector=
   sector address (decimal field) [0-29] [0-59]

length=
   size of the data block in words (decimal field)
   [must be greater than 0 and may be limited in size
   by memory available but not greater than one
   tracks worth]

status mask=
   status mask word (in octal) specifying which
   status bits are to be examined when the status
   word is checked. (The status word is discussed in
   section 2.6)

pattern=
   (octal field) denotes the fixed word pattern that
   will be used on data transfers. If omitted,
   random data patterns will be used.

C=

   if entered, the test will be run continuously
   until terminated by sense switch 3. If omitted,
   the test will be run one time.

The following paragraphs describe the various tests, the
command string needed to execute them, and give examples of
each. Optional parameters are enclosed in brackets.

2.4.1 - Write Test

W unit,sector,length,status mask[,[pattern],[C]].

The test will write a block of data on the current track
starting at the specificed sector. When the operation is
complete, the device status is checked. If in. the
continuous mode, the operation will be executed repeatedly.
If not in the continuous mode, control is returned to the
test monitor.

W 3,28,120,1400,,C.

A 120 word block or random data will be continuously written

on the current track starting at sector 28 on unit 3. The
CRC error bits will be checked after each write.

W 0,9,64,200,125252.

A 64 word block of data with the fixed pattern of 0125252
will be written on the current track at sector 9 of unit 0.
The timing error of the status word will be checked.

2.4.2 - Read Test

R unit,sector,length,status mask[,[pattern],[C]].

The test will read a block of data beginning at the
specified sector of the current track. When the operation
has completed, the device status is checked. The block of
data read is compared against the contents of the write
buffer and any differences noted.

R 0,23,240,110,0,C.

A 240 word block will be continuously read beginning at
sector 23 of the current track on unit 0. The block of data
read will be compared against a block of zeros which has
been inserted in the write buffer.

R 1,0,26,.

A 26 word block of data will be read from sector 0 of the
current track on unit 1. The status word will be checked
against the default mask (any error) and the block compared
to the current contents of the write buffer.

2.4.3 - Echo Test

E unit,sector,length,status mask[,[pattern],[C]].

The test will write a block of data beginning at the
specified sector of the current track. The data is then
read and verified. The device status is checked at the
completion of both the write and read operations. The test
is a combination of the Write Test and the Read Test.

E 0,12,128,2000,,C.

A 128 word block of random data is written starting at
sector 12 of the current track on unit 0. The data is then
read and verified. The test is run continuously, however,

the random block of data is only generated once.

2.4.4 - Seek Test

S unit,track,status mask[,C].

The test will seek to track 0 via recalibrate, (this command resets the diskette unit and the diskette controller to track 0) then to the specified track on the designated unit. At the completion of both seeks the device status will be checked.

S 1,53,100.

The test will select unit 1, seek to track zero, check the status for a seek error, seek to track 53, and check the status for a seek error.

S 0,70,,C.

The test will repeatedly seek to track zero then to track 70 on unit 0. At the completion of each seek the status will be checked for any error.

2.4.5 - Unique Address Test

A unit[,C].

The test writes a one sector block of data in each sector on the specified unit. The first word of the block contains the track address, the second word the sector address, and the remainder a circulating data pattern. After the entire diskette storage unit has been written, each sector is read and the track address, sector address, and the remaining data verified. Any errors are noted on the console.

A 1.

The Unique Address Test will be executed one time on unit 1.

2,4,6 - Compatibility Test

C unit[,C].

The test is essentially the read portion of the Unique Address Test and provides a means of checking the interchangeability of diskettes among units. The Unique Address Test must be run on one unit, the diskette moved to

a second unit, and the Compatibility Test run on the second unit to verify that the data could be recovered.

C 0,C.

The test is run continuously on unit 0.

2.4.7 - Data Transfer Test

D unit[,C].

During one execution of the Data Transfer Test, it will make 512 passes of the following operations: A seek to a random track, the writing of a block of random data of random length beginning at a random sector, the reading of the data and its verification. Any data errors are logged on the console.

D 3,C.

The test will be run continuously on unit 3.

2.4.8 - Sense/Status Test

T unit[,C].

The test will perform a series of operations on the specified unit and check that the expected status and/or sense condition is returned. Among the conditions tested are controller busy, illegal sector, illegal track, end-of-track, and error. If the test finds the unit not ready or write protected, this is noted on the console and the remainder of the test is aborted.

NOTE: This test is run with interrupts disabled.

T 3.

The test is run on unit 3.

2.4.9 - Burn-In Test

B unit[,unit][,unit][,unit].

During one execution of the test, it will make 512 passes of the following operations: Random seek, random write, read, and verify as in the D test. The test is run continuously on the selected unit(s) and only up to five errors per block

are logged.

B 0,1.

The test is continuously run on units 0 and 1.

2.4.10 - Format Test

F unit.

This function will request from the operator the format required for this diskette with the following message:

UNIT n FORMAT TYPE (0=SSMCO, 1=DSMCO, 2=SDIBM, 3=DDIBM)

the operator responds with the format desired: 0=single sided MCO, 1=double sided MCO, 2=single density IBM or, 3=double density IBM the program will command the specified unit to write the proper format. At the completion of the formatting, the header records are read and verified.

NOTE: This test is run with interrupts disabled.

F 2.

Format unit 2.

2.4.11 - Multiple Unit Test

M unit[,unit][,unit][,unit].

During one execution of the test, it will make 512 passes of the following operations: Random seek, write a 120 word block of a selected circulating ones/zeros, read, and verify. The test is performed on each of the selected units simultaneously.

NOTE: This test is run with interrupts disabled.

M 0,1.

The test is run with rapid unit switching between units 0 and 1.

2.4.12 - Reinitialize

I

Reenter the initialization section of the test program to correct or modify parameters.

I

Reenter the initialization section.

2.4.13 - Down Track Function

N unit,track1,track2,

Declare two tracks as unusable and reformat the diskette.

NOTES: If only one track is to be downed, track2 will be a dummy input in the range 80-90.
Two tracks are the maximum allowable.
It is not recommended that track zero be downed.

This function will request from the operator the format required for this diskette with the following message:

    UNIT n FORMAT TYPE (0=SSMCO, 1=DSMCO, 2=SDIBM, 3=DDIBM)

N 3,39,44,

Declare tracks 39 and 44 of the diskette mounted on unit 3 as unusable, reformat tracks 40 through 43 as tracks 39 through 42, reformat tracks 45 through 74 as tracks 43 through 72, and format two previously unused inner tracks as 73 and 74.

N 0,14,80,

Declare track 14 of the diskette mounted on unit 0 as unusable, reformat tracks 15 through 74 as tracks 14 through 73, and format a previsously unused inner track as track 74.

2.5 - ERROR MESSAGES

When an error condition is detected by the program, an associated error message is printed. Most of the error messages will be followed by extension information for determining the specific cause of the error.

    TIMEOUT
        A diskette controller timeout has occurred. The message is followed by the unit number and the location in the program where the timeout

occurred, the track address, sector address, and
the size of the data block.

STAT ERR
An apparent status error occurred. The error
message will be followed by the unit number, the
status read, the track address, sector address,
and the size of the data block.

DATA ERR
A data comparison error has occurred. The error
message will be followed by the unit number, the
status read. The track address, sector address,
and the size of the data block.
Each DATA ERR message will be followed by one or
more printouts which contain the address of the
read buffer where the error occurred, the read
buffer word (was), the write buffer address, the
write buffer word (should be), and a decimal
number indicating the displacement into the buffer
(starting at 1).

BIC LNGT
The final address reported did not compare with
the address computed.

BICBSY W
BIC busy for a write operation.

BICABN W
BIC abnormal sensed after a write operation.

BICBSY R
BIC busy for a read operation.

BICABN R
BIC abnormal sensed after a read operation.

READ TRACK ERROR
A programmed search error has occurred after a
Read Track command. The error message will be
followed by the unit number, the track address,
the byte displacement into the buffer where the
error occurred, the should be data, the was data,
and the program address where the error was
detected.

CONTROLLER NOT BUSY DURING FORMAT

As diskette formatting is done completely under the control of the controller, a test is made during the Format Test to insure the controller will not accept another command. This message is output if the controller does not report busy after a Format Command.

NOT TK00

After a restore command, the unit failed a sense for track zero.

NO FLTSEC

The unit failed to reject an invalid sector address.

NO FLTTRK

The unit failed to reject an invalid track address.

The above error printouts will have a two character acronym printed at the end of the line, this acronym is for the command last executed. The following table defines the acronyms:

    DC - Report Disc Configuration
    FT - Format
    RA - Read Address
    RC - Restore
    RD - Read
    RT - Read Track
    RX - Read using EXCs
    S0 - Select Unit 0
    S1 - Select Unit 1 .
    S2 - Select Unit 2
    S3 - Select Unit 3
    SK - Seek
    UC - Undefined Command
    WR - Write
    WT - Write Track
    WX - Write using EXCs

During the Burn-In Test a counter of passes is displayed after each 512 operations on each unit selected. The octal pass count is followed by an octal

count of recoverable errors, an octal count of non-recoverable errors, and a 12 digit decimal count of words correctly read from all units.

The following messages are output by the test as warning messages only:

    CONTROLLER TYPE ERROR
    UNIT n WRITE.PROTECTED
    UNABLE TO FORMAT THIS UNIT
    POWER FAILURE DETECTED
    PROBABLE WRITE ERROR
    PROBABLE READ ERROR
    PROBABLE BAD SPOT

2.6 - STATUS WORD

Bit	Meaning if set
0	Context Error
1	Not Used
2	Not Used
3	Record Search Error
4	Illegal Disc Address
5	Bad Sector Indicator
6	Seek Error
7	Transfer Timing Error
8	Header CRC Error
9	Data CRC Error
10	Track Overflow
11	Write Protect Violation
12	Selected Unit Not Ready
13	Track Analysis Recommended
14	Not Used
15	Not Used

2.7 - CONSOLE SWITCHES

| SSW1 | Set - Inhibit error printout |
| | Reset - Enable error printout |

| SSW2 | Set - Halt on error |
| | Reset - Do not halt on error |

SSW3   Set – Terminate test
              Reset – Continue test